

Interactive comment on “Methanotrophy potential versus methane supply by pore water diffusion in peatlands” by E. R. C. Hornibrook et al.

Anonymous Referee #1

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General comments:

This manuscript is well-written and thoughtfully prepared. It attempts to assess the role of CH₄ oxidation for controlling CH₄ flux in peatlands and provides information on CH₄ oxidation kinetics, with depth and in two different peatland types, that are currently limited in literature. It also provides detailed profiles of subsurface CH₄ porewater concentrations across a variety of sampling sites and investigates temporal changes in these profiles in relation to precipitation events. This is also a valuable contribution to the peatland CH₄ literature. Because of these strengths I recommend publication of the manuscript following minor revisions. There are several questions that I have to clarify the methods and I also think that the paper could benefit from acknowledgement of some of the shortcomings of the methods. These suggestions will be outlined in more

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detail in the specific comments below.

Specific comments:

Page 2613, lines 10-15: Pore water profiles were collected throughout the summer of 2003 and CH₄ kinetics determined from cores collected in 2005. How appropriate is it to apply the CH₄ kinetics from 2005 to calculate oxidation rates for comparison to CH₄ diffusive flux from 2003? To answer this you need to consider how variable is CH₄ concentration profile between years? How do CH₄ oxidation kinetics vary between years? How do CH₄ oxidation kinetics vary with time over the growing season (i.e. can September kinetics be applied throughout the summer?).

Page 2618, line 7: How was porosity determined in situ; I don't think I saw this explained anywhere. It would also be useful to give a range of the values you determined in the text somewhere.

Pages 2618-2619: Most of the first paragraph in section 4.2 should be moved to the figure caption (a lot of it is already in the captions and is thus repetitive here). Right now when I look at the figures I don't know what the grey bar was, because that information isn't in the caption - only the text. So, moving this to the caption not only tidies up the text, but also helps make the figures understandable without referring to the text.

Page 2620-2621, section 4.4: I have several questions about this section and the comparison of the diffusive flux and calculated methane oxidation. Firstly, what was the criteria used when determining the concentration gradient used for the Fick's Law calculation? Looking at Figs. 3-6 sometimes the regression extends quite deep, other times just to within the 3 cm layer below the CH₄ (0) level and sometimes it seems to ignore some measured values (Figure 5a). I think it would be useful to give some more details in the methods on how these were determined.

Secondly, how appropriate is it to apply the kinetics determined in the lab to the field

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to determine CH₄ oxidation potential rates? I am not surprised that the potential CH₄ oxidation rate is always higher than the diffusive flux because disturbance effects in the lab may overestimate CH₄ oxidation potential and oxygen in the field may be limiting even within the 3 cm layer. I think you have shown pretty clearly by referring to your isotope data that most if not all the CH₄ diffusing across the water table interface is actually oxidized in the field, but I think some recognition of these shortcomings is warranted in the discussion.

Interactive comment on Biogeosciences Discuss., 5, 2607, 2008.

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